FIRST QUARTER
HEALTH IN OPTIMIZING PHYSICAL EDUCATION (3) 12
WORKSHEET WEEK 1

The Immediate Energy System

This system refers to ATP-CP or Adenosine Triphosphate-Creatine Phosphate. It is called the immediate energy system where it is the first system that can be use when doing an activity. It does not require oxygen (anaerobic) and it does not produce lactate (as with glycolysis). Instead, the system involves ATP and Creatine Phosphate that are stored within the muscle fibers.

Athletes who compete in sports that require **high amounts of short duration acceleration**—shot-putters, weightlifters, American football linemen, gymnasts, or sprint-distance speed skaters use the anaerobic a-lactic system. The **ALA** system does not create energy for sufficient duration to create a great deal of waste products.



The Glycolytic System (Anaerobic)

Glycolysis is the pathway that splits carbohydrate (glucose or stored glycogen) in order to generate ATP to power cellular work. This is the second in line to contribute for energy production. This system works during short-duration, high intensity exercises or dances. This is also called the Anaerobic Lactic System.

The **anaerobic lactic** (AL) system (also known as fast glycolysis) provides energy for **medium to high intensity** bursts of activity that lasts from ten seconds to two minutes. Some American football skill positions, baseball players, soccer players, judokas, middle distance runners (400m-800m) and sprinters rely on this system. The **anaerobic lactic system**, as well as the **ATP-CP system**, are capable of **high intensity levels**, and do not rely on oxygen for fuel.



The Oxidative System (Aerobic)

The **aerobic system** is the most utilized of the three. It provides energy for **low intensity activities** that last anywhere from two minutes to a few hours. Unlike the other two systems, the aerobic system requires oxygen and takes much longer to overload. Sports and activities that use continuous sustained efforts such as long-distance swimming, crew (rowing) and sea kayaking rely on the aerobic system.



The energy system of our body works in different ways in which it generates fuel and uses it as an energy to perform a certain task. We all know that in order for our body to work, all we must do is to eat. The food that we eat gives us the energy to do work and to accomplish something. These foods serve as the fuel of our body. A certain energy system of our body becomes predominant depending on the intensity, duration, and type of exercises we perform.

Energy systems in our body include the ATP-CP System, Glycolysis, and Oxidative. In the previous grade level, these energy systems were discussed in the concept of exercise and sports. In this module, you will learn how energy systems function in the concept of dance.

Energy Systems in the Body

The human body uses energy from food to fuel movement and essential body functions, but the body cells don't get energy directly from food. After food is digested, the carbohydrates, protein and fat break down into simple compounds -- glucose, amino acids and fatty acids -- which are absorbed into the blood and transported to various cells throughout the body. Within these cells, and from these energy sources, **adenosine triphosphate (ATP)** is formed to provide fuel.

The body uses 3 different systems to supply cells with the necessary ATP to fuel energy needs. Most of the body's activities use a continuum of all three energy systems, working together to ensure a constant supply of energy.

a. TP-PC System

The body needs a continuous supply of ATP for energy -- whether the energy is needed for lifting weights, walking, thinking or even texting. It's also the unit of energy that fuels metabolism, or the biochemical reactions that support and maintain life. For short and intense movement lasting less than 10 seconds, the body mainly uses the ATP-PC, or creatine phosphate system. This system is **anaerobic**, which means it does not use oxygen. The ATP-PC system utilizes the relatively small amount of ATP already stored in the muscle for this immediate energy source. When the body's supply of ATP is depleted, which occurs in a matter of seconds, additional ATP is formed from the breakdown of **phosphocreatine (PC)** -- an energy compound found in muscle.

b. Lactic Acid System

The lactic acid system, also called the **anaerobic glycolysis system**, produces energy from muscle glycogen -- the storage form of glucose. **Glycolysis**, or the breakdown of glycogen into glucose, can occur in the presence or absence of oxygen. When inadequate oxygen is available, the series of reactions that transforms glucose into ATP causes lactic acid to be produced -- in efforts to make more ATP. The lactic acid system fuels relatively short periods -- a few minutes -- of high-intensity muscle activity, but the accumulation of lactic acid can cause fatigue and a burning sensation in the muscles.

c. Aerobic System

The most complex energy system is the aerobic or **oxygen energy system**, which provides most of the body's ATP. This system produces ATP as energy is released from the breakdown of nutrients such as glucose and fatty acids. In the presence of oxygen, ATP can be formed through glycolysis. This system also involves the Krebs or tricarboxylic acid cycle -- a series of chemical reactions that generate energy in the mitochondria -- the power plant inside the body cells. The complexity of this system, along with the fact that it relies heavily on the circulatory system to supply oxygen, makes it slower to act compared to the ATP-PC or lactic acid systems. The aerobic system supplies energy for body movement lasting more than just a few minutes, such as long periods of work or endurance activities.

This system is also the pathway that provides ATP to fuel most of the body's energy needs not related to physical activity, such as building and repairing body tissues, digesting food, controlling body temperature and growing hair.

Aerobic exercise is any type of cardiovascular conditioning or "cardio". During cardiovascular conditioning, your breathing and heart rate increase for a sustained period of time. Oxygen is your main energy source during aerobic workouts, therefore Oxidative System energy is used.

Benefits of Aerobic Exercises:

> Reduce risk of heart attack
> Reduce risk of type 2 diabetes
> Reduce risk of stroke
> Help lose weight and keep it off
> Help lower and control blood pressure
> Increase stamina and reduce fatigue during exercise
> Activates immune systems, making you less likely to get colds or flu
> Strengthens the heart
> Boosts mood
> Help you live longer than those who doesn't exercise

Anaerobic exercises involve a quick burst of energy and are performed at maximum effort for a short time. The energy systems used are the **ATP** and **Glycolytic System**.

Benefits of Anaerobic Exercises:

> Build muscles
> Lose weight
> Maintain muscle mass as you age
> Strengthens bones
> Burns fat
> Increase stamina for daily activities like hiking, dancing or playing

The Energy Used in Dancing by Cherrish Plummer Production of Lactic Acid

• Lactic acid occurs when your body is working hard.
• When it is not working fast enough, lactate builds up in your muscles causes your muscles to hurt.

Aerobic or Anaerobic

• The motion of dancing (Ballet) is aerobic
• This particular activity is aerobic because in most cases dancing is slow and rhythmical.

Storage

• The body stores ATP in muscle in the form of Glycogen.
• This storage is for needed energy for doing activities

Energy System

• The oxidative system is the primary source of ATP during aerobic activities
• Oxidative energy primarily uses carbohydrates and fats as substrates for energy.

Mitochondrial/Metabolic Rate

• Mitochondria are referred as the "powerhouse of the cell"
• They also contain a lot of the enzymes, associated with aerobic energy
• The aerobic oxidative system forms a big part of our bodies metabolic rate.